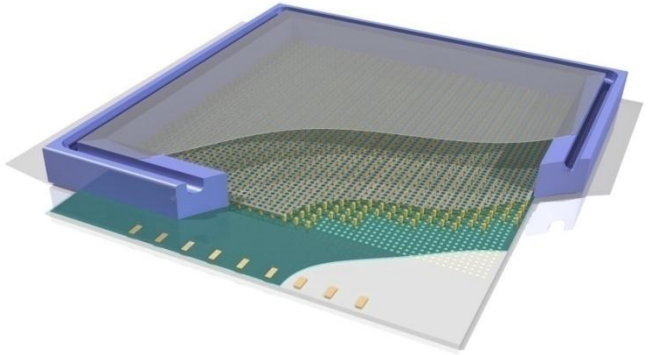
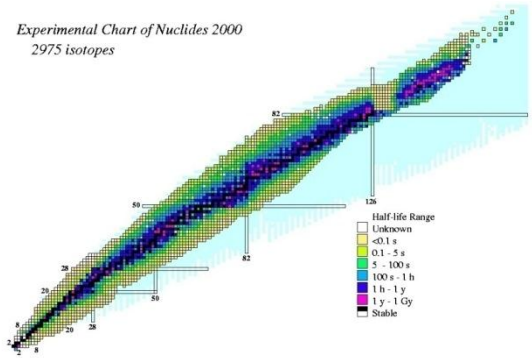
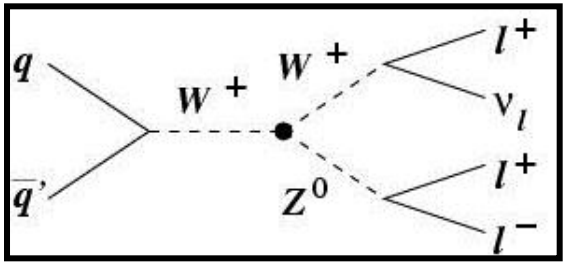




Division for Experimental Physics

Rudjer Boskovic Institute – Zagreb, CROATIA

Tome Antičić
Head



RBI overview

RBI is the largest Croatian multidisciplinary research centre

20 000 m² area

TOTAL = 867 EMPLOYEES

542 RESEARCH STAFF (344 WITH PhD) +
325 SUPPORT AND TECHNICAL STAFF

- Theoretical Physics
- Experimental Physics
- Material Physics
- Electronics
- Physical Chemistry
- Organic Chemistry and Biochemistry
- Material Chemistry
- Molecular Biology
- Marine Research
- Marine & Environmental
- Laser and Atomic Research

70 staff:
- **41 PhDs, including 5 foreign postdocs**
- **19 grad students**
- **10 technicians**

Scientific activities

Particle and astroparticle physics

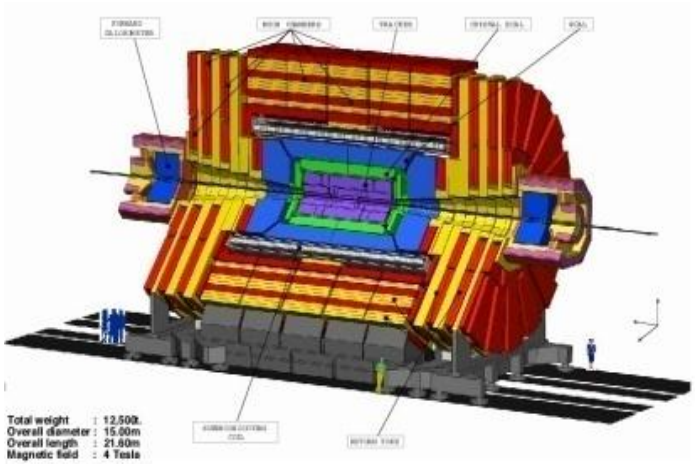
- **Heavy boson production (CMS)**
- **Strangeness production/QGP in pp, pA, and AA collisions (NA61)**
- **Axions (CAST)**
- **Neutrinos (OPERA)**

Astroparticle physics

Nuclear physics

On-site low energy nuclear and applied physics

- **Basic and targetted research on interaction of ion beams with matter, using the local Tandem accelerator facility**



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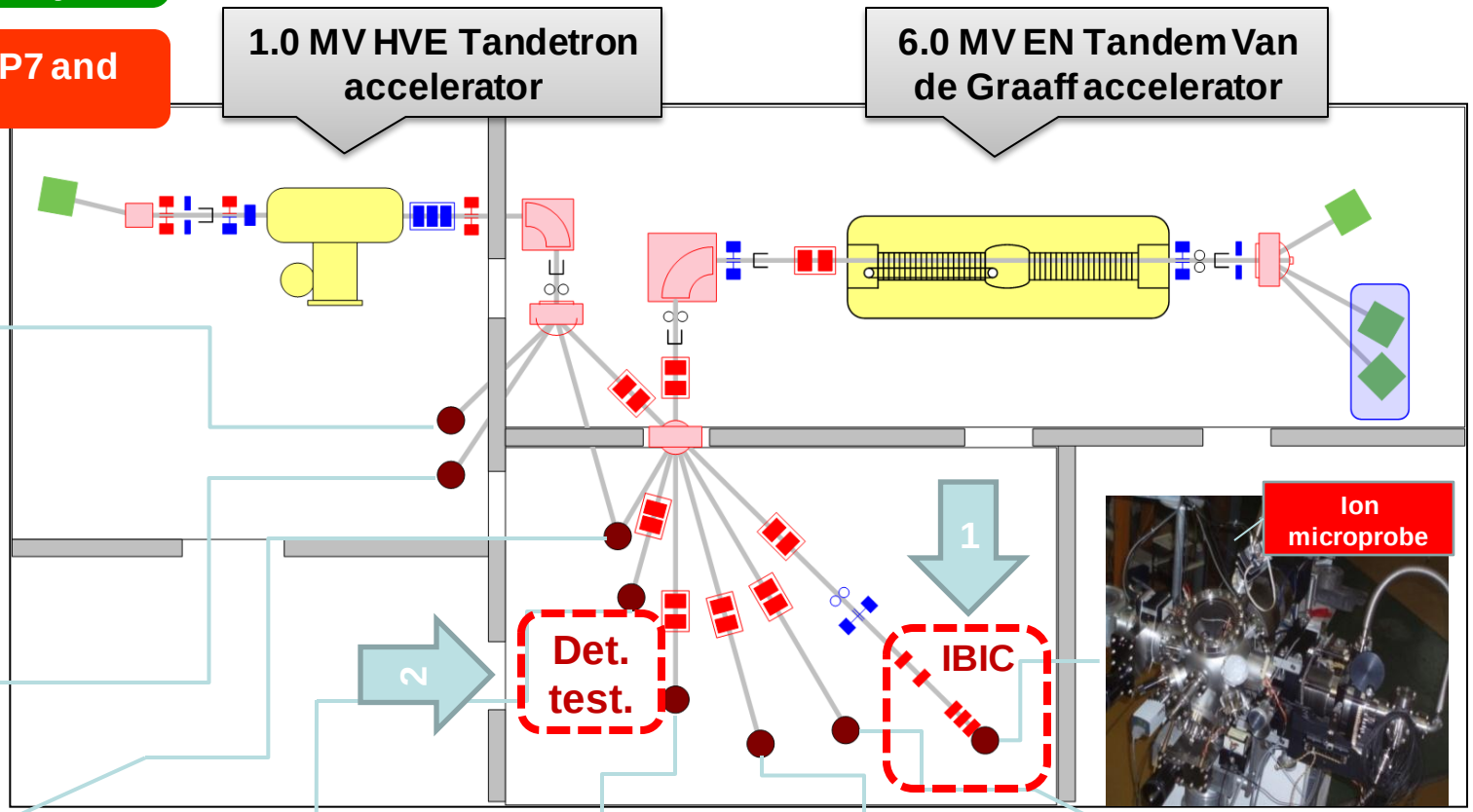
Local accelerator complex

Proposal for a detector testing/irradiation facility

Numerous current FP7 and IAEA projects



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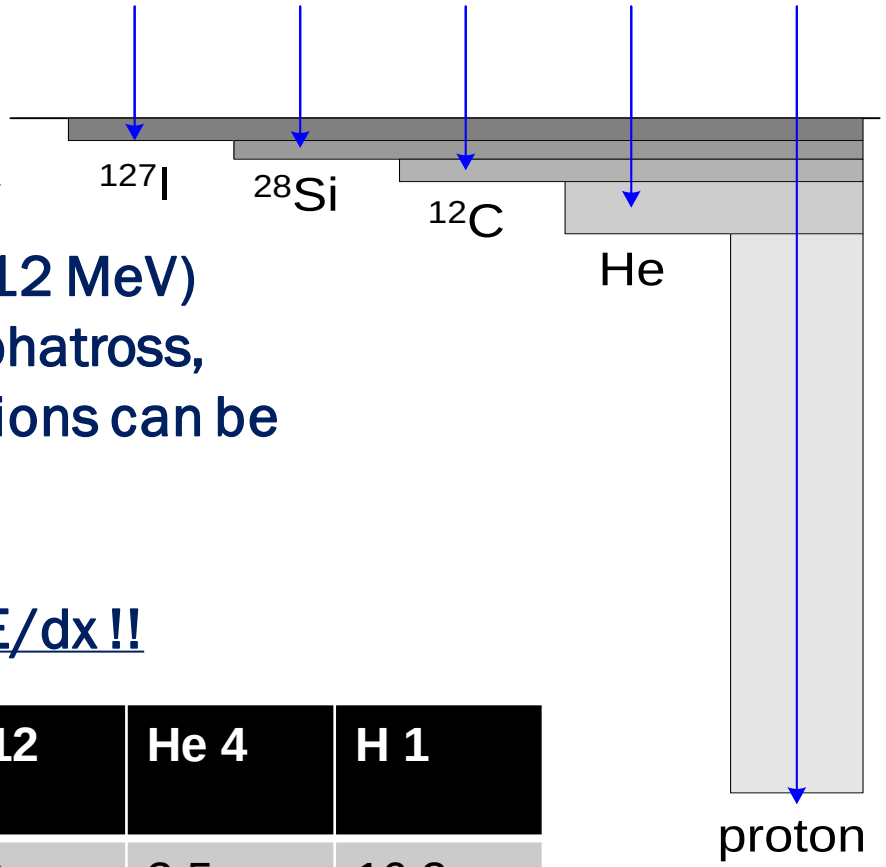
available ion beams

Proposal for a detector testing/irraditation facility



- Terminal voltages – 0.1 to 6 MV (proton energy range 200 keV – 12 MeV)
- Ion sources – sputtering, RF alphatross, duoplasmatron ⟶ most of other ions can be accelerated

Good selection of ion ranges / dE/dx !!

Range in silicon	I 127-	Si 28	C 12	He 4	H 1
Range(μm) E=1 MeV	0.37	1.13	1.6	3.5	16.3
Range (μm) E=10 MeV	3.7	4.8	9.5	69.7	709

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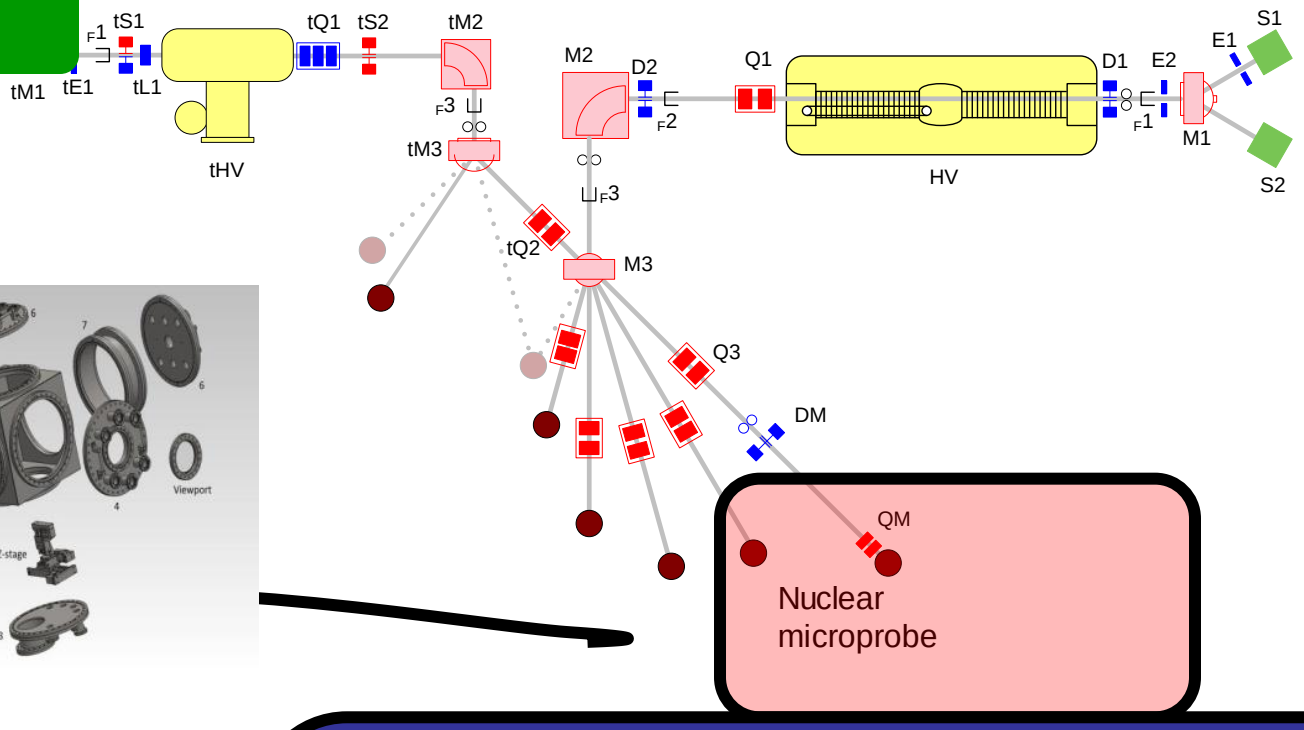
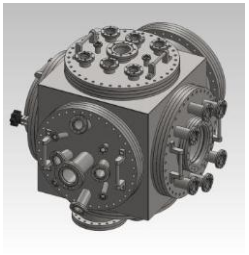
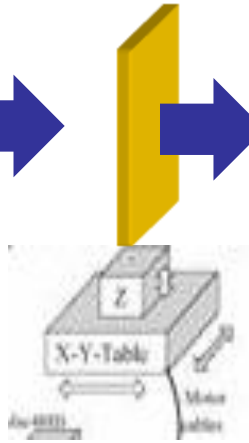
beam testing facility for silicon and diamond detectors in development

Proposal for a detector testing/irraditation facility





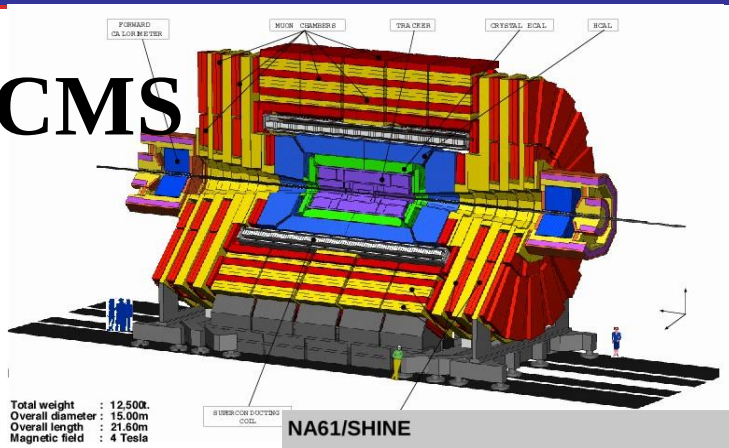
few micron proton beam 10



- ~few micron accuracy at sensor surface good enough for most position accuracy tests
- 10 MeV sufficient to penetrate typical 300 microns of Silicon
- Table moves a few mm in x,y and z direction for precise position determination using actual beam
- Perhaps a partial replacement for complex, expensive, and time consuming test beams in large accelerator complexes.

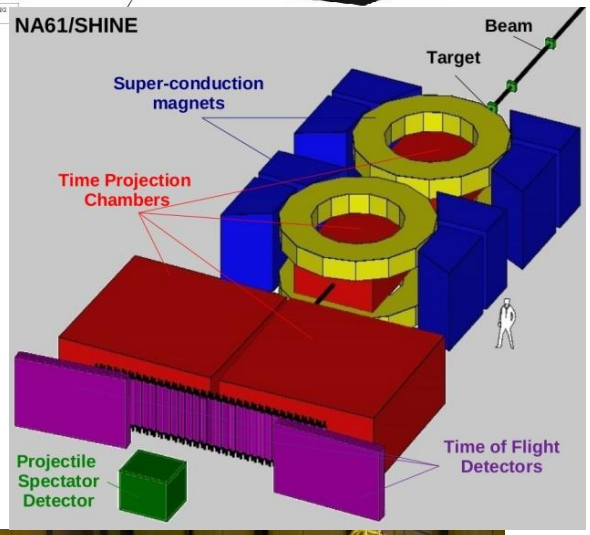
Related activities: Taking part in several CERN experimental activities

CMS



Formally taking part in the CMS pixel upgrade – help PSI in some testing and installation

NA61



Take part, by 2015 effort for NA61 vertex detector: the NIKHEF GOSSIP detector considered

CAST

Might take part in Micromegas upgrade

Funds available from several FP7 projects

PARTICLE DETECTORS

Upgraded Facility for Development of Silicon and Diamond Particle Detector Systems

- University of Birmingham (Department of Physics), UK
- University of Bristol (Department of Physics), UK
- University of Frankfurt/NA61/CERN
- University of Huelva, Spain
- University of Manchester, (Department of Physics), UK
- University of Torino, (Department of Experimental Physics), Italy
- GSI (Detectorlabor group), Germany.

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Funds available from several FP7 projects

SPIRIT

SUPPORT OF PUBLIC AND INDUSTRIAL RESEARCH USING ION BEAM TECHNOLOGY

CAPACITIES

The RBI Van de Graaff is in SPIRIT one of the facilities as TNA provider

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Structural funds – 2013/2014

The RBI Accelerator and Detector Development Complex

Croatia joins EU in 2013.

In first years a substantial asymmetric amount of funds is available for new members – structural funds.

DEP has the necessary basis (existing equipment, projects, know-how) to be able to get and run a 10-20 million Euro investment.

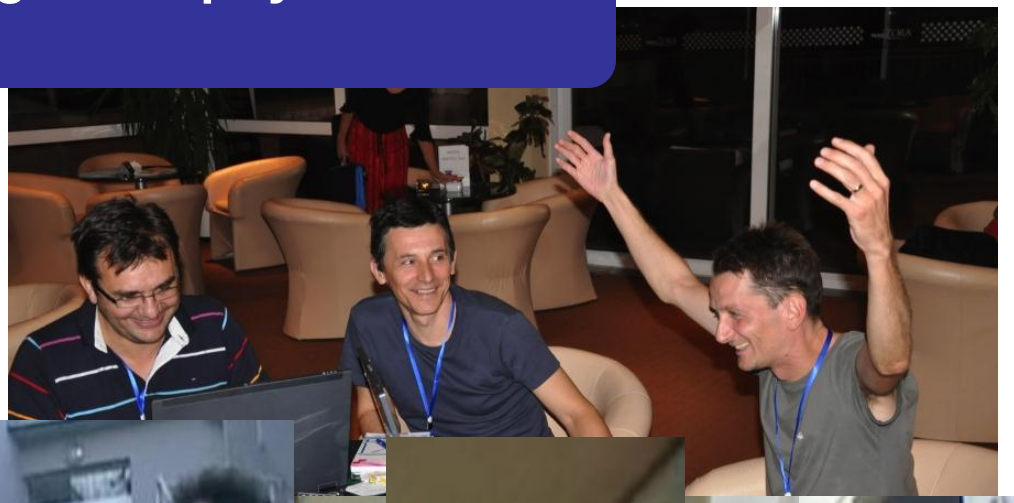
A proposal being written up

- Accelerator center
  - Van de Graaf complex
    - Accelerator facility upgrade
    - Beams (ions and x-rays) for nanomaterials
  - New neutron generator
  - Upgrade of Co-60 source, and the RBI electron linear accelerator for irradiation purposes

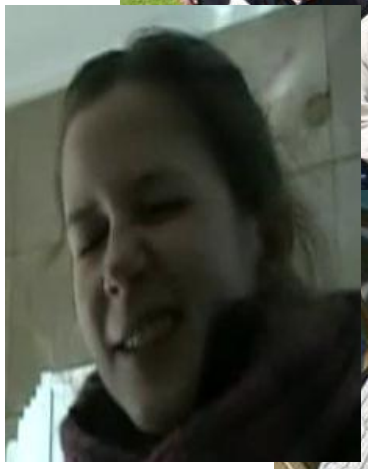
- Detector labs
  - Dual Focused ion beam/ scanning electron microscope, Probe station, clean rooms, wire bonding, Femtosecond Ti-Saphire laser

- ????

Greetings from physics at RBI

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BACKUP SLIDES

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FP7 projects

Acronym	Full project name	Type	No.	Euro
UNCOSS	Underwater coastal sea surveyor	Cooperation / Security	9	404 000
HadronPhysics2	Study of strongly interacting matter	Capacities / Infrastructures	46	11 000
SPIRIT	Support for public and industrial research using ion beam technology	Capacities / Infrastructures	11	214 000
SOWAEUMED	Network in soli waste nad water treatment between Europe and Mediterranean countries	Capacities / Research potential	6	75 000
CLUNA	Clustering phenomena in nuclear physics: strenghening the Zagreb-Catania-Birmingham partnership	Capacities / Research potential	4*	291 000
Particle Detectors	Upgraded facility for developemnt of silicon and diamond particle detetctor systems	Capacities / Research potentia	1*	1 320 000
ENSAR	European nuclear science and applications research	Capacities / Infrastructures	28	50 000
STRAVAL	STUDIES, TRAINING, SOCIO-ECONOMICAL VALORIZATION AND MANAGEMENT OF NATURAL, CULTURAL AND MONUMENTAL PROPERTY FOR THE PROMOTION OF THE LOCAL SOCIETIES OF LATIN AMERICA (ARGENTINA, BRAZIL AND MEXICO)	PEOPLE	2	200 000

A majority of the RBI FP7 projects

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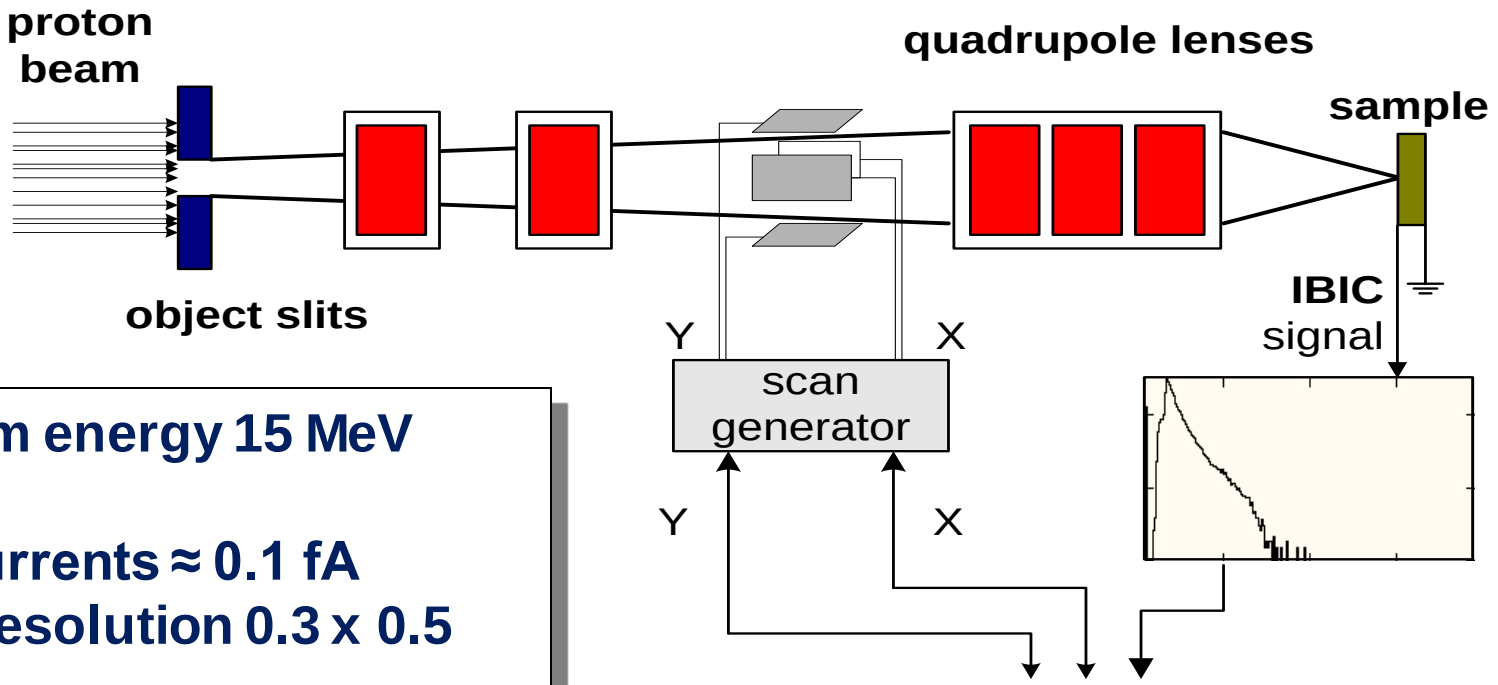
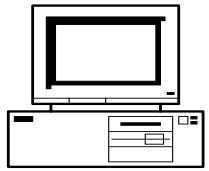
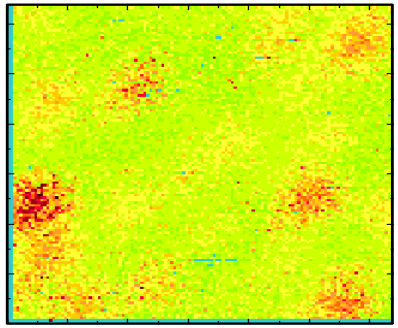
Microprobe



- Maximum energy 15 MeV ME/q2
- Beam currents ≈ 0.1 fA
- Spatial resolution 0.3 x 0.5 um
- Ion hit time can be determined by ~ 1 ns resolution



IBIC - charge collection efficiency images



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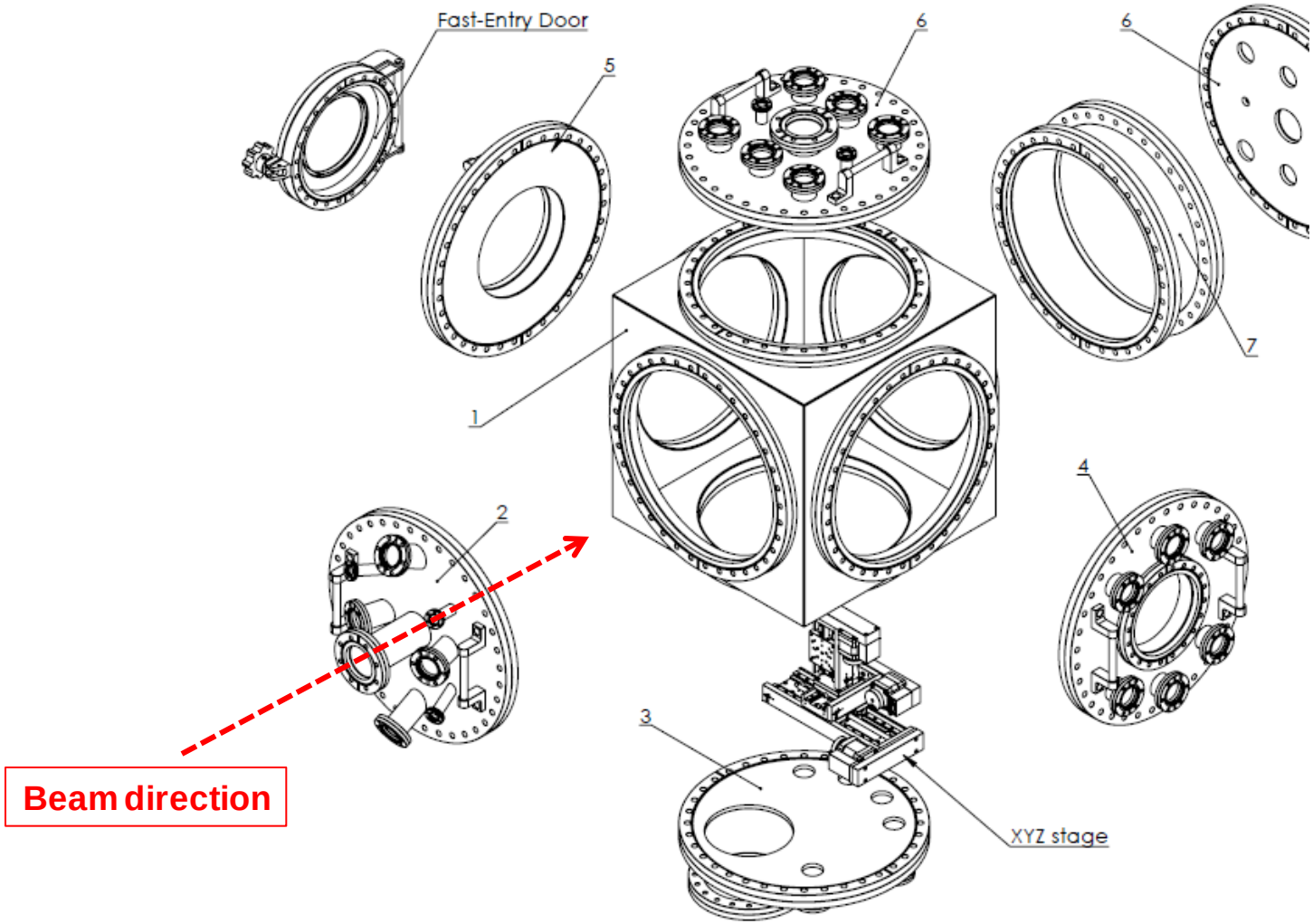
Detector testing beam line



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